

## **BACKGROUND INFORMATION - GOLD KING MINE**

The Gold King Mine is in the Cement Creek watershed, which originates high in the rugged San Juan Mountains of southwestern Colorado near the San Juan County and Ouray County line on the south slopes of Red Mountain Number 3 and the north slopes of Storm Peak.

### Site History

The rugged and relatively inaccessible western San Juan Mountains were first prospected in the area around Silverton in 1860. The extension of the railroad from Silverton up Cement Creek to Gladstone in 1899 encouraged the mining of low grade ores, and the establishment of a lead-zinc flotation plant in 1917 allowed for the treatment of the low grade complex ores found in the area. Over a 100-year period between 1890 and 1991, mining activities in the upper Animas River Basin, including Cement Creek, produced the waste rock and mill tailings sources from which contamination spread throughout the surface water pathway. Over 18 million tons of ore were mined from over 300 mines in the Upper Animas River Basin area, with more than 95 percent of this being dumped directly into the Animas River and its tributaries in the form of mill waste. Older waste rock piles and stope fillings were reworked and sent to mills as technology allowed lower grade ores to be processed economically. A great deal of abandoned waste was also milled during World War II when many older mining and milling structures were cannibalized for scrap metal.

The last producing mine in the area was the Sunnyside Mine, which ceased production in 1991. The closing of the Sunnyside mine occurred after Lake Emma drained into the mine and out the American Tunnel into Cement Creek in 1978. The flood water from the Lake Emma "blow-out" was reported to have flowed down Cement Creek in a 10-foot wall of water that would have transported a large quantity of tailing and other mine waste down Cement Creek to the Animas River.

Under the terms of a consent decree with the State of Colorado, Sunnyside Gold Mine Company performed several large scale projects related to historic operations on properties associated with the company's operations. One project was plugging (installing concrete bulkheads) within the Sunnyside mine workings, including the American Tunnel, during the period from 1996 to 2002. The American Tunnel is located in Gladstone, approximately 1 mile southwest of the Gold King Mine. During the mine operation, the American Tunnel discharged approximately 1600 to 1700 gpm of metal laden water and was treated prior discharging to Cement Creek. Following the installation of the last of the three plugs, flow from the American Tunnel decreased to approximately 100 gpm, the result of leakage around the concrete bulkhead.

Numerous historic and now abandoned mines exist within a two-mile radius of Gladstone. They include: the Upper Gold King 7 Level (Gold King), American Tunnel, Grand Mogul, Mogul, Red and Bonita, Silver Ledge, Evelyne, Henrietta, Joe and John, and Lark mines. Some of these mines have acid mine drainage that flows between 30 and 500 gpm directly or indirectly into Cement Creek and eventually into the Animas River, the confluence located about eight miles downstream of Gladstone.

The flow from the Red and Bonita Mine, the Gold King Mine, and the Mogul Mine all experienced significant increases in flow following the plugging of the American Tunnel. For example, since bulkhead installation, the Red and Bonita discharge rate has increased from negligible to peaks of over 500 gpm.

EPA began investigation of the Red and Bonita Mine in 2010. A groundwater monitoring well was drilled into the Red and Bonita tunnel in September 2010. A pressure transducer was installed in 2010 to provide insight into conditions of the pool of water backed up behind the portal blockage in anticipation of removing the blockage the follow year. The blockage was removed and a new portal installed in 2011.

The mine was investigated from 2011 to 2014, and a bulkhead is being installed in 2015.

Additional information regarding the Animas River watershed in San Juan County is provided in scientific papers that were compiled by the U.S. Geological Survey (USGS) (Church et al 2007). A few quotes from the introductory paper include:

“A substantial component of the elevated metal concentrations and acidity in water can be attributed to weathering of hydrothermally altered rock.”

“Although large amounts of metals and acidity could be removed by remediation of sources in the upper Cement Creek basin, changes in metal loads at the mouth of Cement Creek would be small because much of the metal loading comes from groundwater-fed iron bogs and sedge marshes.”

“The fact that water chemistry from flowing adits has an essentially constant chemical makeup throughout the years of our study demonstrated that adit-water chemistry is not diluted by groundwater coming into a mine pool during spring runoff, but rather that a large supply of water-soluble salts exists in the mines, and that these salts dissolve and saturate the fresh water added by infiltration by snowmelt each year. Thus, mine-adit flow is a constant source of contaminants and acidity to surface streams.”

“Not all sources of metals and acidity in the study area are anthropogenic. Weathering of hydrothermally altered rock not associated with historical mine sites also results in the release of trace elements and acidity that degrade water quality.”

“Trace elements are mobilized and acidity introduced into streams by water flowing through mine workings, across mine-waste dumps, and over and through mill tailings disposed of on the flood plain and in stream reaches.

“Water most affected by historical mining will have a pH <3 with elevated concentrations of iron, aluminum, cadmium, copper, lead, zinc, arsenic and nickel.”

“Anecdotal data indicate that native trout could be caught in the Animas River prior to mining, and the report indicates that water quality in the Animas River was good prior to mining.”

“No newspaper accounts exist that document fish living in Cement Creek.”

“Data from springs in unmined areas, stream-sediment data from terraces, and the absence of paleontological evidence for a viable aquatic ecosystem at the time the terrace deposits formed suggest that a viable macroinvertebrate community probably did not exist....in cement Creek prior to mining.”

“Monitoring of the recovery of sensitive macroinvertebrates along with improvements of water quality as remediation proceeds is a proposed method for monitoring functional recovery of the aquatic community.”

“The poorest water quality occurs during low flow in January and February.”